2018B F=ma Exam: Problem 6

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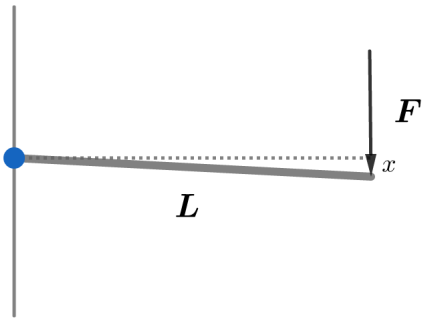

We are given

$$x \propto \frac{F}{I} E^\alpha L^\beta$$

From dimensional analysis,

$$[x] = \frac{[F]}{[I]} [E]^\alpha [L]^\beta$$

$$L = \frac{F}{L^4} \frac{F^\alpha}{L^{2\alpha}} L^\beta$$

We have

$$0 = 1 + \alpha$$

$$1 = -4 - 2\alpha + \beta$$

Hence,

$$\alpha = -1$$

$$\beta = 3$$

$$x \propto L^3$$

so the answer is $\boxed{\text{D}}$.